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Description

This invention relates to the structure and manufacture of a protective fabric suitable for use as a heat and flame barrier. More particularly, the fabric may be used to prevent the combustion of flammable materials by using the fabric as a barrier between the heat source and any flammable materials.

Various types of protective fabrics have been developed for use in applications in which fabric covered articles (e.g., upholstered articles or office panels) must be capable of withstanding exposure to heat and/or flame without combustion. For example, in upholstered aircraft seating, a heat resistant protective barrier fabric is typically provided between the outer upholstery fabric and the underlying flammable foam cushion to retard or prevent combustion of the cushion in the event of fire. Note, for example, US-A 4,463,465 to Parker et al which discloses a barrier fabric which comprises an aramid fabric substrate and an outer aluminum foil layer. The use of an aluminum foil layer, however, has several drawbacks, namely the fabric has limited breathability and the cushioning aspects of the upholstered article are reduced.

US-A-4,509,559 to Cheetham et al discloses an exemplary fire-resistant fabric used as a protective cover for hoses employed to transport inflammable liquids. The fabric comprises an innermost layer of a thermally intumescent material, an intermediate layer of a fabric impregnated with alumina trihydrate and an outermost polished metal sleeve. This fabric is resistant to fire but has very limited flexibility and formability, making it unsuited for many applications, such as with upholstery.

US-A-4, 569, 878 to Barrall et al discloses a fire-resistant laminate material, useful as office partitions, comprising a series of layers of woven and non-woven synthetic material and glass which are bonded together with an intumescent composition comprising a metal oxide, calcium silicate and phosphoric acid. This fabric also has limited flexibility and breathability.

Another technique for producing a fire-resistant fabric for use as a flame barrier is to coat the fabric with a fire-resistant compound. Exemplary compounds include those based on an inorganic hydrated compound such as hydrated alumina, hydrated magnesia, magnesium oxychloride, hydrated zinc borate and hydrated calcium borate. Coatings of this type, however, leave spaces between the fibers of the fabric. These spaces of interstices potentially allow hot gases and/or flames to penetrate therethrough and ignite the underlying flammable material.

EP-A-0 096 534 discloses a fire-resistant mattress including a composite made of a layer of fire-retardant material capable of providing a heat barrier bonded to a layer of high tensile strength material, such as fiberglass fabric.

WO-A-8303434 discloses a flame-retardant yarn comprising a multifilament glass fiber core covered with a staple fiber adhered to a polymer coating around the core.

The present invention provides a flame durable fire barrier fabric which is resistant to high temperature fires, is lightweight and breathable and is highly conformable and flexible. The fabric of the present invention includes a flame durable textile fabric substrate formed of corespun yarns and an intumescent coating applied to one surface of the textile fabric substrate. The corespun yarns comprise a core of a flame resistant filament, such as fiberglass filaments, and a sheath of staple fibers. The intumescent coating, when exposed to heat, swells and forms an insulating char, filling the interstices between the yarns, choking off the flames and thereby making the fabric substrate resistant to melting or burning. The coating does not adversely affect flexibility and breathability during normal use, and the fabric substrate can be easily conformed to the underlying flammable material.

Some of the features and advantages of the invention having been stated, others will appear as the description proceeds, when considered in conjunction with the accompanying drawings, in which --

Figure 1 is an enlarged detailed isometric view of a portion of a fire-resistant fabric having an intumescent coating thereon in accordance with the invention, with the layers broken away to more clearly reveal the fabric construction.

Figure 2 is an enlarged detailed isometric view similar to Figure 1 showing a fire-resistant fabric having an intumescent coating on one surface thereof and a reflective paint coating on the opposite surface thereof.

Figure 3 is an enlarged detailed isometric view of the fire-resistant fabric shown in Figure 1, located between an upholstery fabric outer layer and an underlying flammable foam layer.

Figure 4 is an enlarged detailed isometric view of the fire-resistant fabric shown in Figure 2, located between an upholstery fabric outer layer and an underlying flammable foam layer.

The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown.

As shown in Figure 1, the fire-resistant barrier fabric 10 of the present invention comprises a textile fabric substrate 11 formed of yarns 15 and an intumescent coating 20 on one surface of the fabric substrate

11. As shown in Figure 3, the fire-resistant fabric 10 may be used as a flame barrier by locating it between an underlying flammable layer 35 and a decorative fabric outer layer 40 with the intumescent coating layer 20 preferably contacting the outer layer 40 and facing the flame source.

The textile fabric substrate 11 is flame durable and at least some portion of the fabric remains intact upon exposure to a flame so that the fabric substrate 11 forms a base or support for the intumescent coating layer 20. The fabric substrate 11 may be of any of the various fabric constructions, such as fabrics of knitted, woven, non-woven, braided, warp lay, and scrim reinforced web construction. A knitted construction is preferred because of its ease and inexpensiveness of construction and such a construction has excellent flexibility and conformability properties, and is breathable because of its inherent porosity.

The yarns 15 of these fabrics are of corespun construction, the production of which is described, for example in EP-A-0.385.025 (priority: 3.3.89; filing date: 8.9.89; publication date: 5.9.90). One particularly suitable corespun yarn construction comprises a filament core of from about 20% to 40% of the total weight of the corespun yarn, while the sheath of staple fibers comprise from about 80% to 60% of the total weight of the corespun yarn. The filaments of the core may be fibers of glass, polybenzimidazole, polyimides, polyarenes, various metals, Kevlar , Nomex , and carbon or carbonizable compounds. The core may also be blends of these fibers or may be of a multicore construction where a combination of the fibers are used. Fiberglass is preferred because it is an inexpensive, but flame durable filament. The staple fibers of the sheath surrounding the core may be fibers of either natural or synthetic material, such as cotton, polyester, rayon, wool, nylon, acrylic, modacrylic, acetate or blends of these fibers.

Referring to Figure 1, a textile fabric substrate 11 of knitted construction is illustrated. The knitted construction is characterized by the intermeshing of loops of the yarns 15. The set of yarns may consist of a single yarn (i.e. weft knit) or groups of yarns (i.e. warp knit). As shown in Figure 1, the loops 15 of yarn are formed by a single weft thread and are formed across the width of fabric. Such a construction is porous and breathable.

The flame resistant barrier fabric 10 of this invention is produced by applying an intumescent coating 20 to one surface of the textile fabric substrate 11. The intumescent coating is preferably applied as a lightweight and porous foam or froth using conventional coating techniques such as a knife coater, a roll coater, spray coating, calendering, transfer coating or screen printing. Various intumescent compounds are known and one particular suitable class of intumescent compounds comprises a source of carbon (i.e. a carbonific), a catalyst, and a source of non-flammable gas (i.e. a foaming or blowing agent). Exemplary carbonifics include carbohydrates, proteins or polyfunctional alcohols such as starch, casein or pentaerythritol. On exposure to flame, the catalyst causes the carbonific compound to swell and char. Exemplary catalysts include inorganic acids such as boric, phosphoric, or sulfuric acid, or may include compounds which on decomposition form an inorganic acid such as mono- or diammonium phosphates, melamine, and urea. The source of non-flammable gas for foaming the intumescent coating may be provided by the catalyst, for example if melamine is used as the catalyst, or alternatively be provided by a compound which upon exposure to a flame evolves the gas such as ammonia, carbon dioxide or hydrogen chloride. The intumescent composition may be compounded with binders and thickeners and the like to aid in the specific application of the coating. Additionally, conventional flame retardant fillers such as alumina trihydrate, silicates, kaolin, gypsum and hydrated clay may be added.

In everyday use, the barrier fabrics of the present invention are lightweight and flexible and are breathable because of their porosity which is one of the results of applying the coating as a porous foam and not as a non-porous film. The porosity and breathability of a fabric is expressed in terms of the "air permeability" of the fabric. Air permeability is measured in accordance with ASTM Standard Test Method D737 for Air Permeability of Textile Fabrics. The rate of flow through a known area of fabric is adjusted to secure a prescribed pressure differential between the two surfaces of the fabric in the test area and from this rate of flow the air permeability of the fabric is determined. Thus, using a 4mm calibration orifice through which air is blown at a rate of 0.106 cubic metres (3.73 cubic feet) per minute, the coated fabric of the present invention has an air permeability of about 0.0283 to 8.49 cubic metres (1 to 300 cubic feet) per minute, with from about 0.566 to 2.264 cubic metres (2 to 80 cubic feet) per minute being typical, and a value of from about 0.283 to 0.849 cubic metres (10 to 30 cubic feet) per minute being preferred.

The barrier fabrics are particularly suitable as flame barriers in upholstered articles since the fabric flame barrier can easily be conformed to the shape of the article, and its excellent breathability does not detract from the desirable aesthetic properties of the decorative outer fabric. In particular, the air permeability of the barrier fabric assures good air circulation for comfort. The air permeability of the barrier fabric is also particularly important when the barrier is used with cushioned upholstered articles used for seating. Because of the air permeability of the flame barrier fabric, air is free to escape from the cushion when it is compressed. Thus, the fabric avoids the hard and uncomfortable "balloon" effect that is

characteristic of most prior art air impermeable flame barrier fabrics.

However, when the barrier fabric of the present invention is exposed to high temperature and/or flame, the intumescent compound reacts and swells to form a char which closes the pores of the compound itself and fills the pores or interstices between the yarns. The char is substantially incombustible and has cellular characteristics. The char thus acts as a flame barrier and limits the penetration of flames and hot gases through the fabric to ignite the underlying flammable material. The corespun yarns also contribute to the flame resistance properties of the fabric. The flame resistant core filaments remain intact on exposure to a flame and along with the charred remains of the sheath fibers, provide a lattice or support for the intumescent coating.

As illustrated in Figure 2, a reflective paint coating 30 also may be applied to the barrier fabric on the surface opposite that of the intumescent coating 20. This layer serves to reflect radiant heat from the underlying flammable material. Additionally, this layer does not significantly effect the air permeability and the flexibility of the barrier fabric. The reflective paint coating 30 is preferably a metallic paint and contains metal flake pigments and a flame-durable binder. A metal flake pigment with good leafing properties and good reflecting properties is preferred. Exemplary metal flake pigments having high reflectivity include aluminum, brass, copper, gold, nickel and silver. Aluminum is preferred because of cost and an exemplary aluminum flake is LSB-547 Leafing Aluminum Flake available from Reynolds Metal Company of Richmond, Virginia. The flame-durable binder is preferably a silicone alkyd resin and a suitable one is Kelsol 3970 Modified Silicone Alkyd Resin sold by Spencer-Kellogg Company of Hightstown, New Jersey. This resin when exposed to a flame reacts in a manner so that the metal flakes of the pigment intimately bind to the substrate and to each other. If it is desirable to use water to adjust the viscosity of the paint coating, aqueous ammonia may be included to improve the compatibility of the binder with the water.

Suitable reflective metal paints also may include Pyromark 2500 and Pyromark 800 aluminium paint available from Tempil Division of Big Three Industries, Inc. of South Plainfield, New Jersey and Lo-Mit-1 aluminium paint available from Solar Energy Corporation of Princeton, New Jersey. The paint coating 30 is applied by conventional techniques and may be dried at high temperatures and long exposure to improve adherence of the paint coating to the fabric layer. Typically about 149°C (300°F) for 60 seconds is optimum to adhere the paint coating to the fabric layer to ensure maximum abrasion resistance.

The fire barrier fabric of the invention is particularly useful as a flame barrier for use in upholstered articles and building materials for offices such as wall coverings, wall panels, office panel partitions, ceiling panels, floor coverings and the like, bedroom articles such as mattress and pillow ticking, mattress and pillow covers, draperies, tenting, awnings, field fire shelters and sleeping bag covers. The fabric is lightweight, breathable and flexible and can easily be molded and formed so as to conform to oddly-shaped upholstered articles and building materials such as when laminating the fabric thereto.

In operation, the intumescent coating 20 is applied as a foam or froth, and is applied to the textile fabric substrate 10 by conventional coating techniques as described above. The coating is applied a rate of about 8.47 to 678 grammes (dry) per square metre (0.25 to 20 ounces per square yard) with a rate of from about 67.8 to 119 grammes (dry) per square metre (2.0 to 3.5 ounces per square yard) being preferred. The coated substrate is then dried and the coating cured. The coated substrate, with or without the reflective paint coating 30, and the decorative surface fabric or upholstery layer 40 may be bonded together using conventional adhesives or using the inherent tackiness and adhesive characteristics of the intumescent coating. In the latter bonding technique, the intumescent coating is only partially cured so that the coating is tacky, and then the substrate and the upholstery layer 40 are fusion bonded together using pressure followed by the intumescent coating being completely cured at low temperature. An underlying flammable layer 35 such as a foam layer, non-woven batting layer, fiberfill layer or feather layer also may be supplied wherein the surface of the textile fabric substrate 10 opposite that of the intumescent coating and the flammable layer 35 are bonded together using conventional adhesives.

Thus, as shown in Figure 3, the fabric may be used as a barrier in upholstered articles wherein the fabric 10 is placed between the underlying flammable layer 35 such as a polyurethane foam layer and the upholstery layer 40 with the intumescent coating facing towards the flame source and away from the flammable layer 35. As shown in Figure 4, a fabric with the intumescent coating 20 and a reflective paint coating 30 in contact with the flammable layer 35 also may be used as a barrier between the flammable layer 35 and an upholstery layer 40.

Several coated fabrics are illustrated by the following examples, which are to be considered as illustrative of the present invention. It should be understood that the invention is not limited to the specific details of the examples.

Examples

Knitted fabrics having a corespun construction comprising a fiberglass filament core and a cotton staple sheath were formed using conventional techniques. These fabrics were coated with an intumescent coating and in Example 2 the fabric was additionally coated with a reflective paint coating. After coating, a polyurethane foam was stapled thereto with the intumescent coating facing away from the foam layer/substrate interface. These fabrics were compared to a standard fabric formed from non-coated knitted glass/cotton corespun yarns. The test method consisted of exposing the fabric with the intumescent coating layer closest to a flame from a Bunsen burner at 649°C (1200°F) for 2.5 minutes. The samples were visually evaluated for the extent of damage to the underlying polyurethane foam pad.

Example 1

A knitted corespun yarn fabric was coated with an intumescent coating comprising the following:

	% by weight	g/sq m (oz/sq yd) dry solids fabric
Vinylidene chloride/acrylic latex binder	26.69	59.325 (1.750)
Sodium lauryl sulfate foaming agent	0.76	1.695 (0.050)
Sodium salt of n-octadecyl sulfosuccinimate	0.24	0.102 (0.003)
Melamine blowing agent	2.20	4.882 (0.144)
Pentaerythritol carbonific compound	4.58	10.17 (0.300)
Phosphorus pentoxide flame retardant	13.72	30.51 (0.900)
Guar gum thickener	0.92	2.034 (0.060)
Water	51.09	---

The coating was frothed by placing the coating composition in a blender and mixing at a high speed. The frothed coating composition with a foam ratio of 2.5 to 1 was then applied to one surface of the fabric and dried by heating. The dried coating on the fabric had a dry solids weight of 108.5 g/sq m (3.2 oz/sq yd).

Example 2

The intumescent composition coated fabric of Example 1 was coated on the opposite surface with a 16.95 g/sq m (0.5 oz/sq yd) (dry solids weight) coating of a reflective paint comprising the following:

	% by weight	g/sq m (oz/sq yd) dry solids fabric
Water-compatible leafing aluminium flake	17	2.882 (0.085)
Water-reducible silicone alkyd resin	34	5.763 (0.170)
Aqueous ammonia	7	1.186 (0.035)
Water	42	---

The standard fabric had extensive damage to the underlying foam pad, whereas the fabrics of Examples 1 and 2 had a slight charring of the foam pad only at the point directly above the flame. Additionally, the fabrics of examples 1 and 2 had good strength and flexibility.

Claims

1. A fire-resistant fabric suitable for use as a flame barrier, said fabric comprising a flame durable textile fabric substrate (11) and a flame barrier coating layer (20) carried by one surface of said textile fabric substrate (20), characterized in that the textile fabric substrate (11) is formed of corespun yarns (15), said yarns comprising a core of flame resistant filament and a sheath of staple fibers, and in that the coating layer (20) is breathable and intumescent.

2. A fire-resistant fabric according to claim 1 characterized in that the intumescent coating layer (20) comprises a carbonific compound, a catalyst and a source of a non-flammable gas.

3. A fire-resistant fabric according to claim 1 or claim 2 characterized in that the intumescent coating layer (20) is frothed and is applied at a rate of from about 6.8 to 678 grammes per square metre (0.2 to 20 ounces per square yard) of surface area of the substrate (11).

4. A fire-resistant fabric according to claim 3 characterized in that the intumescent coating layer (20) has an air permeability of from about 0.0283 to 8.49 cubic metres (1 to 300 cubic feet) per minute.

5. A fire-resistant fabric according to claim 4 characterized in that the intumescent coating layer (20) has an air permeability of from about 0.566 to 2.264 cubic metres (2 to 80 cubic feet) per minute.

6. A fire-resistant fabric according to claim 5 characterized in that the intumescent coating layer (20) has an air permeability of from about 0.283 to 0.849 cubic metres (10 to 30 cubic feet) per minute.

7. A fire-resistant fabric according to any preceding claim characterized in that the filament of said core is fiberglass and wherein the staple fibers of said sheath are selected from the group consisting of cotton, polyester, rayon, wool, nylon, acrylic, modacrylic, acetate and blends thereof.

8. A fire-resistant fabric according to any preceding claim characterized in that the textile fabric substrate (11) is of a knitted construction.

9. A fire-resistant fabric according to any one of claim 1 to 6 characterized in that the textile fabric substrate (11) is of a woven construction.

10. A fire-resistant fabric according to any preceding claim characterized in that a reflective flame durable paint coating (30) is carried by the opposite surface of said textile fabric (11).

11. A fire-resistant fabric according to claim 10 characterized in that said reflective paint coating (30) comprises a reflective metallic paint.

12. A fire-resistant fabric according to claim 10 characterized in that said reflective metallic paint comprises metal flake pigments and a flame durable silicone alkyd resin binder.

13. An article of manufacture comprising the fire-resistant fabric of claim 1, said article being selected from the group consisting to upholstered articles, office building materials, bedroom articles, draperies, tents, awnings, field fire shelters and sleeping bag covers.

Patentansprüche

1. Feuerfestes, zur Verwendung als Flammensperre geeignetes Gewebe, welches ein flammbeständiges Textilgewebesubstrat (11) und eine von der einen Oberfläche des Textilgewebesubstrats (20) gestützte Flammensperrüberzugschicht (20) aufweist, dadurch **gekennzeichnet**, daß das Textilgewebesubstrat (11) aus umsponnenen Garnen (15) gebildet ist, wobei die Garne einen Kern aus flammfestem Filament und einen Mantel aus Stapelfasern aufweisen, und daß die Überzugschicht (20) atmungsfähig und blähfähig ist.

2. Feuerfestes Gewebe nach Anspruch 1, dadurch gekennzeichnet, daß die blähfähige Überzugschicht (20) eine verkohlungsfähige Verbindung, einen Katalysator sowie eine Quelle eines nicht entflammbaren Gases aufweist.

3. Feuerfestes Gewebe nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß die blähfähige Überzugschicht (20) geschäumt und in einem Maß von etwa 6,8 bis 678 Gramm pro Quadratmeter (0,2 bis 20 Unzen pro Quadratelle) Oberflächenbereich des Substrats (11) aufgebracht ist.

4. Feuerfestes Gewebe nach Anspruch 3, dadurch gekennzeichnet, daß die blähfähige Überzugschicht (20) eine Luftdurchlässigkeit von etwa 0,0283 bis 8,49 Kubimeter (1 bis 300 Kubifuß) pro Minute hat.

5. Feuerfestes Gewebe nach Anspruch 4, dadurch gekennzeichnet, daß die blähfähige Überzugschicht (20) eine Luftdurchlässigkeit von etwa 0,566 bis 2,264 Kubimeter (2 bis 80 Kubifuß) pro Minute hat.

6. Feuerfestes Gewebe nach Anspruch 5, dadurch gekennzeichnet, daß die blähfähige Überzugschicht (20) eine Luftdurchlässigkeit von etwa 0,283 bis 0,849 Kubimeter (10 bis 30 Kubifuß) pro Minute hat.

7. Feuerfestes Gewebe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Filament des Kerns Glasfaser ist und bei dem die Stapelfasern des Mantels aus der aus Baumwolle, Polyester, Reyon, Wolle, Nylon, Acryl, Modacryl, Acetat und Gemischen derselben bestehenden Gruppe ausgewählt sind.

8. Feuerfestes Gewebe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Textilgewebesubstrat (11) ein gestricktes Gefüge hat.

9. Feuerfestes Gewebe nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das Textilgewebesubstrat (11) ein gewebtes Gefüge hat.

10. Feuerfestes Gewebe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die entgegengesetzte Oberfläche des Textilgewebes (11) einen reflektierenden, flammbeständigen Farbüberzug (30) trägt.

11. Feuerfestes Gewebe nach Anspruch 10, dadurch gekennzeichnet, daß der reflektierende Farbüberzug (30) eine reflektierende, metallische Farbe aufweist.

12. Feuerfestes Gewebe nach Anspruch 10, dadurch gekennzeichnet, daß die reflektierende, metallische Farbe Metallflockenpigmente und ein flammbeständiges Silikonalkydharzbindemittel aufweist.

13. Feuerfestes Gewebe gemäß Anspruch 1 aufweisender Fertigungsartikel, der aus der Gruppe ausgewählt ist, die aus gepolsterten Artikeln, Bürogebäudematerial, Schlafzimmergegenständen, Vorhängen, Zelten, Markisen, Feuerzufluchteinrichtungen im Freien und Schlafsackbezügen besteht.

Revendications

1. Toile ininflammable convenant pour l'utilisation comme barrière antifeu, ladite toile comprenant un substrat de toile textile durable au feu (11) et une couche de revêtement de barrière antifeu (20) portée par une surface dudit substrat de toile textile (11), caractérisée en ce que le substrat de toile textile (11) est constitué de fils à âme (15), lesdits fils comprenant une âme en filament ininflammable et une gaine en fibres discontinues, et en ce que la couche de revêtement (20) est respirable et intumescente.

2. Toile ininflammable suivant la revendication 1, caractérisée en ce que la couche de revêtement intumescente (20) comprend un composé carboné, un catalyseur et une source de gaz ininflammable.

3. Toile ininflammable suivant la revendication 1 ou la revendication 2, caractérisée en ce que la couche de revêtement intumescente (20) est sous forme de mousse et est appliquée à raison de 6,8 à 678 g/m^2 environ de surface effective du substrat (11).

4. Toile ininflammable suivant la revendication 3, caractérisée en ce que la couche de revêtement intumescente (20) possède une perméabilité à l'air comprise entre 0,0283 et 8,49 m^3/min environ.

5. Toile ininflammable suivant la revendication 4, caractérisée en ce que la couche de revêtement intumescente (20) a une perméabilité à l'air comprise entre 0,566 et 2,264 m^3/min environ.

6. Toile ininflammable suivant la revendication 5, caractérisée en ce que la couche de revêtement intumescente (20) a une perméabilité à l'air comprise entre 0,283 et 0,849 m^3/min environ.

7. Toile ininflammable suivant une quelconque des revendications précédentes, caractérisée en ce que le filament de ladite âme est en fibres de verre, et les fibres discontinues de ladite gaine sont choisies dans le groupe comprenant coton, polyester, rayonne, laine, nylon, résine acrylique, résine modacrylique, acétate et leurs mélanges.

8. Toile ininflammable suivant une quelconque des revendications précédentes, caractérisée en ce que le substrat de toile textile (11) est de structure tricotée.

9. Toile ininflammable suivant une quelconque des revendications 1 à 6, caractérisée en ce que le substrat de toile textile (11) est de structure tissée.

10. Toile ininflammable suivant une quelconque des revendications précédentes, caractérisée en ce qu'un revêtement de peinture réfléchissante durable au feu (30) est porté par la surface opposée de ladite toile textile (11).

11. Toile ininflammable suivant la revendication 10, caractérisée en ce que ledit revêtement de peinture réfléchissante (30) comprend une peinture métallisée réfléchissante.

12. Toile ininflamamble suivant la revendication 10, caractérisée en ce que ladite peinture métallisée réfléchissante comprend des pigments en paillettes métalliques et un liant de résine silicone alkyde durable au feu.

13. Article manufacturé comprenant la toile ininflammable de la revendication 1, ledit article étant choisi dans le groupe comprenant des articles capitonnés, des matériaux de construction de bureaux, des articles de chambre à coucher, des draperies, des tentes, des bâches, des abris anti-incendie et des couvertures de sacs de couchage.

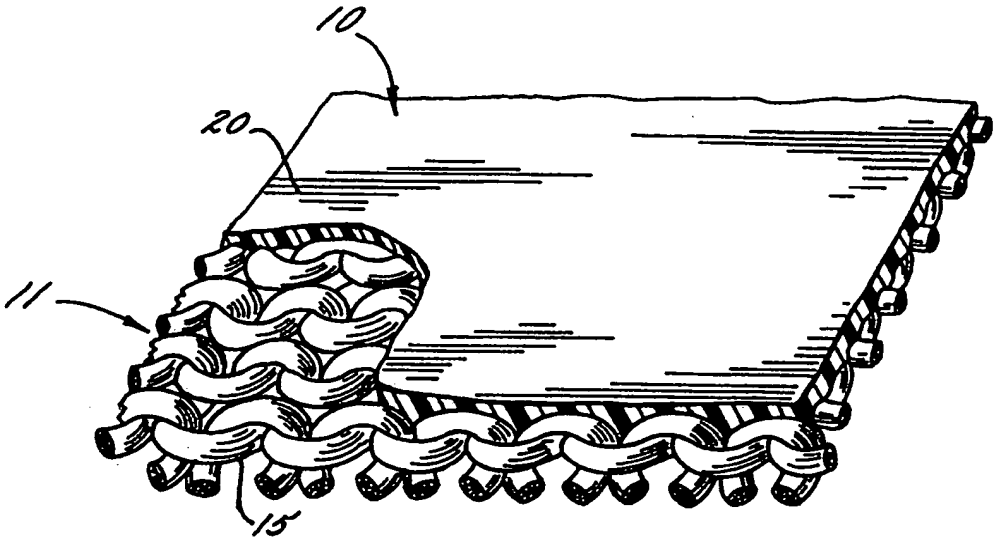

Fig. 1.

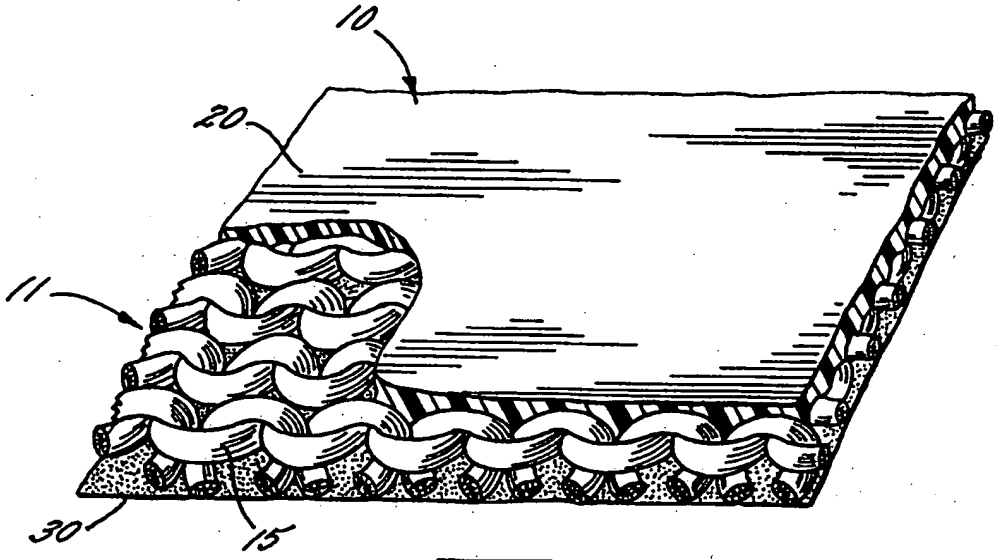

Fig. 2.

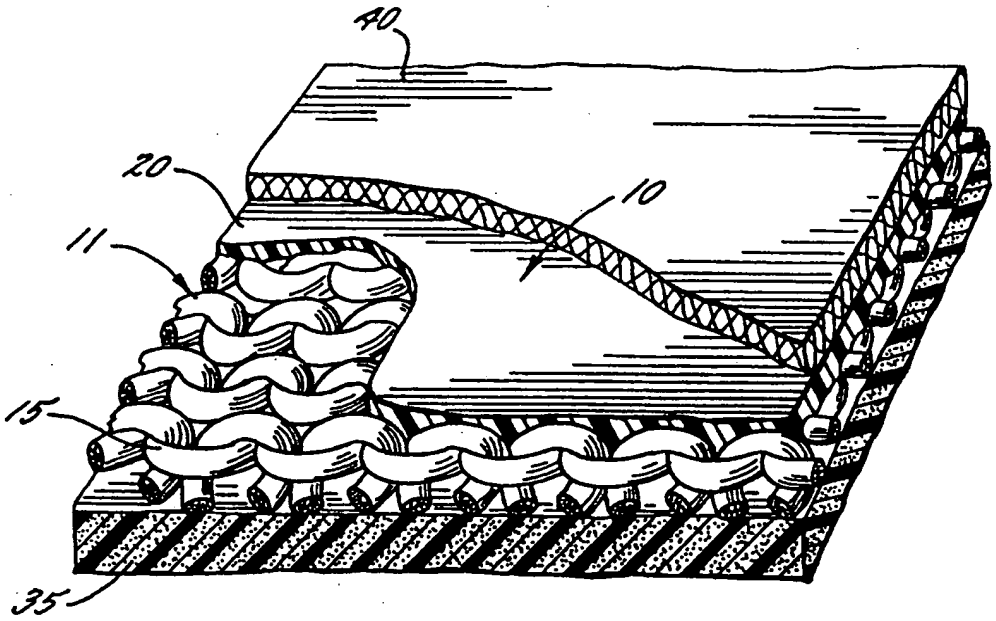

Fig. 3.

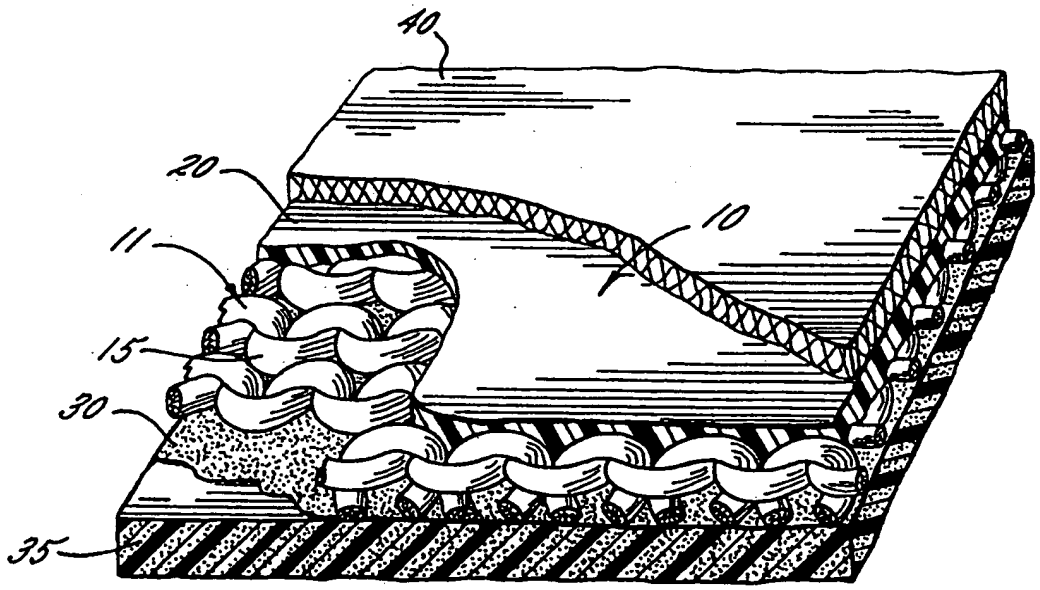

Fig. 4.